Remarks

Claim Amendments

Claim 1 has been amended to include the limitations of cancelled claim 14. The claims have been amended in an attempt to put the claims in condition for allowance. Applicants note that the amendment includes only subject matter that has already considered by the Examiner, so no further search is required. Applicants therefore respectfully request that the amendment be entered.

Rejections Under 35 U.S.C. Section 103

The claims have been rejected under 35 U.S.C. Section 103(a) as being unpatentable over Corvasce et al. (U.S. Patent No. 5,672,639; hereinafter "Corvasce") in view of Huynh-Tran et al. (US2003/0152758, hereinafter "Huynh-Tran").

Claim 1 has been amended to include the limitations of canceled claim 14. Claim 1 now recites a tire having a tread comprising the recited rubber composition.

Applicants urge that amended claim 1 is not obvious in view over Corvasce in view of Huynh-Tran.

As noted by the Examiner, Corvasce teaches the use of a starch/synthetic plasticizer composite filler in tire tread rubber compounds, however, Corvasce is silent regarding the use of an adduct of maleic anhydride and polybutadiene in the tread compound. Huynh-Tran is directed to improving the adhesion of a fiber reinforcement to rubber through use of a maleinized polybutadiene added to the rubber and/or to a coating on a fiber (abstract) and is silent regarding the use of maleinized polybutadiene in a tread compound.

By contrast, the present claims are directed to a tire having a tread comprising a rubber composition comprising a starch/synthetic plasticizer composite filler and an adduct of maleic anhydride and polybutadiene. One skilled in the art would not be motivated to add a maleinized polybutadiene of Huynh-Tran to the rubber composition of Corvasce; nowhere does Huynh-Tran

nor Corvasce teach nor suggest that such a rubber composition would be useful for a tread. In fact, Corvasce teaches only to use a silane coupling agent with the starch/synthetic plasticizer composite filler in a tread compound (Examples I, II and III).

Moreover, the present specification includes evidence of unexpected results to obviate any finding of obviousness. Corvasce teaches that the performance of a starch/synthetic plasticizer composite filler in a tread compound is improved through the use of a silane coupling agent in combination with the starch/synthetic plasticizer composite filler (Examples I, II, and III). By contrast and as taught in the specification at Page 24, Line 14, to Page 25, Line 9, in the present specification the data of Table 7 indicate that, for loss modulus measured at 50°C, a much wider range of values for G" exists for starch/synthetic plasticizer composite filler and rubber compositions having the maleic anhydride/polybutadiene adduct than for starch/synthetic plasticizer composite filler and rubber compositions having silane. The Dispergrader data in Table 6 indicate that the filler dispersion in the maleic anhydride/polybutadiene adduct concentration range of 3 phr to 7.5 phr (Samples 9 through 12; a higher value of white surface area indicates poorer dispersion) was approximately equivalent to the filler dispersion in the silane concentration range of 3 phr to 5 phr (Samples 14 through 16). For these approximately equivalent levels of filler dispersion, the variation in G" with maleic anhydride/polybutadiene adduct concentration (from about 0.028 to about 0.05) was much greater than that for the silane (from about 0.03 to about 0.036). <u>Such a wide variation in G" allows compound design to achieve a compromises between properties such as tear resistance and damping characteristics with the maleic anhydride/polybutadiene adduct that are not possible with the silane</u>. One skilled in the art would have no expectation of such behavior, based on the teaching of Corvasce regarding the use of the silane, nor based on the teaching of Huynh-Tran regarding the maleinized polybutadiene.

Table 7 also shows a comparison of the loss moduli at -10°C for samples containing

maleic anhydride/polybutadiene adduct or silane. The loss modulus G" at -10°C for the silane compositions (Samples 14 through 16) was approximately constant over the strain range. By contrast, the loss modulus at -10°C for maleic anhydride/polybutadiene adduct compositions (Samples 8 through 13) was nonlinear over the strain range, similar to the unfilled composition (Sample 7). While not wishing to be bound by any theory, this behavior suggests that a core-shell interphase between the polymer matrix and the starch/plasticizer composite filler exists and remains soft at low temperature, and as a consequence can induce higher loss properties than is possible with the silane. The behavior of the 100 and 300 percent modulus also supports the idea of a soft-core shell. For equivalent dispersion levels, the 100 and 300 percent moduli as shown in Table 6 are consistently lower for Samples 8 through 13 as compared with Samples 14 through 16. The lower stiffness at large strain may be attributable to the softer core shell with the adduct of maleic anhydride and polybutadiene, as compared to the silane. The tangent delta behavior at equal dispersion also supports the idea of a soft-core shell. Table 6 shows that equal dispersion was obtained for 3 phr of the adduct of maleic anhydride and polybutadiene (Sample 9) and for 3 phr of silane (Sample 14). However, tan delta at -10°C is much higher for Sample 9 (.194) as compared to Sample 14 (0.116), while the tan delta at 50°C is approximately equal for Samples 9 and 14 (0.028 and 0.025). This suggest that core-shell remains soft at low temperatures for compositions including the adduct of maleic anhydride and polybutadiene, possibly due to the lower Tg as compared with the silane.

The loss modulus, 100 and 300 percent moduli, and tan delta behavior of Samples 8 through 13 as compared to the silane samples 14-16 is highly surprising and unexpected. As noted, this behavior indicates that the physical properties of the rubber composition may be tailored to provide a wider range of tear and hysteresis values than is possible with silane coupling agents. Other physical properties are equal or superior as compared with the silane. By contrast, Huynh-Tran teaches only the advantage of using maleinized polybutadiene on the

adhesion of rubber compounds to reinforcing fiber or cord. One skilled in the art would clearly not expect, based on Huynh-Tran or Corvasce, the behavior in the present invention.

Conclusion

Applicants urge that the amended claims are now fully patentable over the cited art. Applicants respectfully request allowance of all claims.

Respectfully submitted,

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